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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/993,208 | 11/16/2001 | Jinbao Jiao | AP01979 | 8084 |
| 22917 | 7590 | 03/03/2004 | EXAMINER | |
| MOTOROLA, INC. 1303 EAST ALGONQUIN ROAD IL01/3RD SCHAUMBURG, IL 60196 | | | AFTERGUT, JEFF H | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 1733 | |

DATE MAILED: 03/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | |
|------------------------------|------------------------|---------------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 09/993,208 | JIAO ET AL. |
| | Examiner | Art Unit |
| | Jeff H. Aftergut | 1733 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 14 January 2004.
- 2a) This action is **FINAL**. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-5,7,10-12,27 and 28 is/are pending in the application.
- 4a) Of the above claim(s) 11,12,27 and 28 is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-5,7 and 10 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: _____

Election/Restrictions

1. Claims 11, 12, 27, and 28 have been withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 3.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1, 3, 4, 7 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jensen et al (newly cited) in view of Williams et al (newly cited) and any one of Derwent Abstract of South African patent 317040 (newly cited), Japanese Patent 2-34987 (newly cited) or Leonard et al (newly cited).

Jensen et al suggested that it was known at the time the invention was made to join a heat sink 12 with an adhesive material 40 to the underside of a printed circuit board 21 as well as to join electrical components 10 on the opposite side of the board 21 with a solder material 14, 36. Jensen et al did not suggest the manner in which one joined the heat sink to the flexible substrate 21 with the metal traces thereon with the adhesive 40. Additionally, the manner that the solder 14, 36 was provided and/or reflowed was not expressly described by the reference. One skilled in the art would have understood that the substrate 21 was a flexible circuit, see column 5, lines 7-13. The reference additionally did not express that the heat sink was formed from aluminum material as claimed. The applicant is referred to column 2, lines 30-61 for the specific heat generating components 10 which were secured to the substrate. Additionally, at column 3, lines 3-15 for the brief discussion of the adhesive 40 and column 3, lines 20-25 for the discussion of

Art Unit: 1733

the solder. Additionally, see column 4, line 64-column 5, line 6 for the solder and adhesive compositions used.

Williams et al suggested those skilled in the art at the time the invention was made would have incorporated an adhesive to join a heat sink to a printed circuit board (column 1, line 68-column 2, line 5, column 3, line 9-12, column 4, lines 19-22) wherein the adhesive is provided with a pattern onto the substrate. The reference suggested that those skilled in the art at the time the invention was made would have provided the adhesive in a liquid form, coated the adhesive upon the substrate to be bonded (in this case upon the heat sink for instance), subjected the adhesive to partial curing via exposure to UV radiation to yield a b-staged adhesive, and bringing the coated substrate (the heat sink) into contact with the other substrate and subjected the assembly to final cure with heat. The reference suggested that one attaching a rigid heat sink to a printed circuit (in this case a flexible printed circuit of Jensen) would have understood that the adhesive used in the operation would have been initially cured to a tacky b-stage state after application in liquid form and subsequently would have been subjected to a final cure with heat to attach the two substrates together. The reference makes no mention as to how or when one skilled in the art would have attached the components to the other face of the printed circuit with the solder.

However, the references to any one of Derwent Abstract of South African patent 317040, Japanese Patent 2-34987 or Leonard et al suggested that it was known at the time the invention was made to join one component onto a printed circuit board with an adhesive and to join another component onto the board with solder wherein the reflowing of the solder took place simultaneous with the curing of the adhesive in the manufacture of the assembly. More

specifically, the abstract of the disclosure of South African 317040 suggested that rather than having to perform the joining of the components with the adhesive and the solder in two steps, one heating step can be performed in order to join both components together one with solder and one with adhesive. The reference to Leonard suggested that an adhesive 24 would have been used to join one component 22 to a circuit board 10 while a solder 14 would have been used to join another component 12 to the board 10. The reference to Leonard suggested that the curing of the adhesive and the reflow of the solder would have taken place at the same time, see column 2, lines 27-60. The reference to Japanese Patent 2-34987 suggested (as set forth in the abstract enclosed herewith) that one skilled in the art would have joined some components to a board with solder and others to the board with adhesive wherein the adhesive was cured and the solder allowed to reflow in a single step of heating wherein energy would have been saved and the operation would have been simplified (rather than having to perform plural heating steps, one to cure the adhesive and one to reflow the solder). Clearly, the art is replete with processes wherein the solder joined components were attached simultaneously with adhesive joined components in a single heating operation.

The references as set forth above do not expressly state that: (1) solder would have been applied in Jensen via screen printing processes, and; (2) the heat sink in Jensen was an aluminum heat sink. However, one of ordinary skill in the art would have found it conventional in the art at the time the invention was made to employ a screen printing operation to apply the solder in Jensen as such was conventional in the art of application of solder for application of solder upon a circuit board (and the use of conventional means for application of the solder would have been within the purview of the ordinary artisan). Additionally, the use of aluminum for the heat sink is

Art Unit: 1733

taken as conventional in the art. The use of conventional materials for the heat sink is taken as within the purview of the ordinary artisan. The applicant is advised that there is nothing in the claims which render something other than an aluminum heat sink a rigidizer and therefore the use of an aluminum heat sink on one side of the flexible board of Jensen is deemed to be attachment of a rigidizer to a flexible board (note that the circuit board 21 in Jensen is flexible and the attachment of a metal layer (an aluminum heat sink) to the same would have rigidized the assembly.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to simultaneously cure the adhesive and reflow the solder when attaching the heat sink and the components in Jensen as such would have saved time and energy as expressed by any one of Derwent Abstract of South African patent 317040, Japanese Patent 2-34987 or Leonard et al wherein the adhesive employed to attach the heat sink to the board was one which was initially applied in liquid state and then partially cured to a b-stage prior to application of the heat sink to the circuit board as suggested would have been useful in attachment of the same to provide a patterned coating as suggested by Williams et al.

With respect to claim 3, note that the reference to Williams suggested exposure of the adhesive to a curing device in order to b-stage the resin in the operation. Regarding claim 4, note that the adhesive employed by Williams is a dual cure resin system wherein one part of the resin was cured with radiation and the other part was cured with heat. Regarding claim 7, note that the reference to Jensen suggested that the circuit substrate 21 was a flexible circuit board substrate. It should be noted that the reference to Williams suggested coating one of the substrates (the circuit board or the heat sink), partially curing the adhesive, and the bringing the other of the substrates

Art Unit: 1733

into contact with the partially cured adhesive. One would have applied the adhesive to either the circuit board or the heat sink and application of the adhesive to either prior to assembly would have been within the purview of the ordinary artisan. Regarding claim 10, note that Williams suggested that one of ordinary skill in the art would have "soft baked" the adhesive to partially cure it prior to exposure to radiation for the provision of the discontinuous coating wherein the soft baking heated the adhesive to initial a partial cure of the resin followed by a completion of the cure after assembly.

4. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as set forth above in paragraph 3 further taken with any one of Bluem et al (newly cited), Masayuki et al (newly cited) or Banovetz et al (newly cited).

While the references as set forth above in paragraph 3 suggested the overall processing, the adhesive was applied upon the heat sink via spin coating followed by UV exposure to provide a discontinuous pattern coating upon the heat sink. However, the use of screen printing to provide an adhesive for joining a heat sink to a printed circuit board was known for application of a patterned adhesive coating as suggested by any one of Bluem et al, Masayuki et al or Banovetz et al. More specifically, each of Bluem et al (column 15, lines 26-42), Masayuki et al column 4, lines 45-52) or Banovetz et al (paragraph [0073] suggested that it was known at the time the invention was made to screen print an adhesive for joining a heat sink to a circuit board in the manufacture therein. They all express that such screen printing techniques were well known techniques for application of a pattern of adhesive upon a substrate. Because it would have been viewed as an alternative technique for the application of the adhesive materials in Williams et al (as opposed to the spin coating followed by exposure with a mask to provide a

Art Unit: 1733

pattern coating as Williams performed), it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the techniques of any one of Bluem et al, Masayuki et al or Banovetz et al to screen print the adhesive material upon the substrate in the process of attaching a heat sink to a printed circuit board as set forth above in paragraph 3.

5. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as set forth above in paragraph 3 further taken with Chipbonding Adhesive or Dual Cure System Adhesives.

While the references as set forth above in paragraph 3 suggested the overall operation, they failed to expressly state that a "dual cure system" was employed. It should be noted that in Williams a resin adhesive which was initially cured partially with heat followed by completion of the cure with heat was suggested (thereby suggesting a dual cure resin). To further emphasize that "dual cure resin adhesives" were known per se for bonding materials to a board, the references to either one of Chipbonding Adhesive or Dual Cure System Adhesives are cited. These references suggested that those skilled in the art at the time the invention was made would have incorporated a dual cure resin system to assemble components upon a flexible circuit board as suggested above. It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ a dual curing adhesive material to assemble the heat sink to the board as suggested by Chipbonding Adhesive or Dual Cure System Adhesives in the operation as set forth above in paragraph 3 wherein such adhesives were generically described by Williams et al.

It should be noted that both of the references to Chipbonding Adhesive or Dual Cure System Adhesives suggested that one skilled in the art at the time the invention was made would

have recognized that either heat or uv curing mechanisms would have been suitable for the means for curing the resins in the dual curing systems described (also note that Williams employed heat to partially cure prior to final curing with heat).

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as set forth above in paragraph 5 further taken with McIver et al (newly cited).

While the references as set forth above in paragraph 5 suggested the use of just heat to partially cure the resin followed by final heating to c-stage (or completely cure) the resins employed as the adhesive, the references failed to expressly suggest that the adhesive material employed to form the joint between the heat sink (the aluminum rigidizer) and the flexible circuit board was an epoxy resin. However, in the art of attaching a heat sink to a printed board, it was known at the time the invention was made to incorporate an epoxy resin to join a heat sink to a circuit board wherein the epoxy resin was partially cured (b-staged) and then the adhesive was finally cured to join the materials together, see column 3, line 63-column 4, line 40. It would have been obvious to one of ordinary skill in the art to employ a dual cure adhesive wherein the curing mechanism for both cures was heating (as suggested by Chipbonding Adhesive or Dual Cure System Adhesives as discussed above) wherein the adhesive selected would have included epoxy adhesive materials as suggested by McIver et al for joining a heat sink to a board substrate in the manufacture of a laminated board having a heat sink thereon as well as electrical components mounted to the same.

Response to Arguments

7. Applicant's arguments with respect to claims 1-5, 7, and 10 have been considered but are moot in view of the new ground(s) of rejection.

Art Unit: 1733

It should be noted that the newly applied references would have directed one skilled in the art to attach the components with solder and the heat sink with adhesive wherein the adhesive was finally cured and the solder allowed to reflow in a single heating operation simultaneously as now claimed.

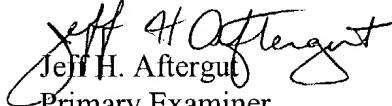
Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.K. 1,594,843 suggested the joining of a heat sink of aluminum with a board with adhesive.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeff H. Aftergut whose telephone number is 571-272-1212. The examiner can normally be reached on Monday-Friday 7:15-345 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on 571-272-1226. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Jeff H. Aftergut
Primary Examiner
Art Unit 1733

JHA

25 February 2004